Remarks

Claims 1-8 and 17-20 are currently pending in the patent application. For the reasons and arguments set forth below, Applicant respectfully resubmits that the claimed invention is allowable over the cited references.

The Office Action dated March 16, 2007 indicated the following: claims 1-3 and 6 stand rejected under 35 U.S.C. § 102(b) over Coleman (U.S. 5,155,062); claims 1-3, 6, 8, 17 and 20 stand rejected under 35 U.S.C. § 102(b) over Klumpp *et al.* (non-patent literature); claims 4 and 5 stand rejected under 35 U.S.C. § 103(a) over Coleman as applied to claims 1-3 and 6 above, and in further in view of Kaeppeler *et al.* (WO 01/14619); and claims 7, 18 and 19 stand rejected under 35 U.S.C. § 103(a) over Coleman in view of Kaeppeler as applied to claims 4 and 5 above, and in further view of Kobayashi *et al.* (non-patent literature).

In an effort to facilitate prosecution and in an attempt to avoid a lengthy appeal process, Applicant has proposed amending claim 1 to read "employing nitrogen as a carrier gas" by removing the phrase "or a noble gas." Applicant respectfully requests that the Examiner enter this amendment. Applicant submits that none of the cited references teach using nitrogen as a carrier gas (as is discussed in detail below), as such, Applicant submits that the claims are in condition for allowance.

The Section 102(b) rejection of claims 1-3 and 6 are improper because the cited portions of the Coleman reference fail to correspond to all of the claimed limitations, including those directed to employing nitrogen as a carrier gas (*see, e.g.*, claim 1). While the cited portions of the Coleman reference indicate that nitrogen can be present in source and carrier gases, these cited portions do not teach or suggest using nitrogen as the actual carrier gas for a source gas used in a CVD process. Specifically, the Final Office Action cites to two portions of the Coleman reference, including the Abstract in which no mention of nitrogen is made, and a portion of column 1 that describes undesirable effects related to the presence of nitrogen in source or carrier gases. For convenience, the cited portion of col. 1 of the Coleman reference is recited below:

> In particular, intrinsic silicon carbide epitaxial layers grown by chemical vapor deposition have a carrier concentration of nitrogen that generally is always at least $1x10^{17}$ atoms per cubic centimeter (cm^{-3}("1E17"). Conventional wisdom holds that this intrinsic nitrogen is a consequence of nitrogen present in the source and carrier gases used during chemical vapor deposition. The result is that intrinsic

silicon carbide epitaxial layers will always have donor atoms present to at least this extent. Although this may not present a problem when the resulting silicon carbide is to be n-type, it raises significant difficulties when p-type silicon carbide is desired.

The mere presence of nitrogen in a source or carrier gas does not teach employing nitrogen as a carrier gas for a CVD process as in the claimed invention. For example, as is common with many CVD processes, deposition is carried out in a chamber that is subjected to atmospheric conditions and, accordingly, has molecules commonly found in the immediate manufacturing atmosphere (*i.e.*, air, which is predominantly nitrogen). This chamber is pumped or otherwise placed under a vacuum condition, and a source gas is introduced to the chamber using a carrier gas and used in the deposition of a material in the source gas. However, in these CVD processes, at least some nitrogen may remain in the chamber or is otherwise present with the source and/or carrier gasses as described in the portion of the Coleman reference cited above. In this regard, Coleman's discussion of undesirable nitrogen that can be present in CVD-grown epitaxial layers (and, source or carrier gasses does not teach using nitrogen as a carrier gas as claimed. Accordingly, the Section 102(b) rejection of claim 1, as well as the rejection of claims 2-3 and 6 that depend from claim 1, is improper and Applicant requests that it be withdrawn.

The Section 103(a) rejection of claims 1-3, 6, 8, 17 and 20 over the Klumpp reference is improper and should be removed because the cited portions of the Klumpp reference fail to correspond to all of the claimed limitations including those directed to chemical vapor deposition of an epitaxial layer on a silicon substrate using source gases. In an attempt to address Klumpp's failure to cite source gasses, the Examiner asserts Official Notice that the use of source gases is well known and asserts that the use of source gases can be combined with the teaching of the Klumpp reference. However, Applicant submits that this assertion of Official Notice is improper because it is contrary to the teachings of the Klumpp reference, which is directed to using a liquid source (discussed further below), and because no evidence has been cited in support of the assertion. Should the rejection be maintained, Applicant further requests evidence in support of the proposition that such teaching is well known in the prior art and further showing that there is adequate evidence of motivation to combine this prior art with the main reference, consistent with MPEP § 2144.03.

Regarding the rejections of claims 8, 17 and 20, these rejections are improper because the indicated range of temperatures is not present in the Klumpp reference as asserted and further does not anticipate the claimed limitations. Specifically, the Final Office Action indicates that Klumpp discloses depositing at a temperature of about 450-1000°C without citing to any portion of the Klumpp reference. However, as it appears that the Final Office Action is referring to Klumpp's Abstract, Applicant notes that the Abstract discloses no such limitation; rather, it discloses "[t]empering of the carbide at 450 and 1000°C." In this regard, Klumpp does not disclose a range of about 450-1000°C as suggested in the office action, but instead two temperatures of 450°C and 1000°C. Moreover, an overlapping range (or specific temperatures that happen to fall within a claimed range) do not anticipate the claimed limitations where the cited reference fails to teach the claimed range with "sufficient specificity" in order to anticipate claimed limitations. See M.P.E.P. §2131.03, and M.P.E.P. §2112(IV). In this regard, the Klumpp reference fails to disclose the limitations in claims 8, 17, 20 for these reasons as well, and Applicant therefore requests that the rejections be withdrawn.

The Section 103(a) rejection of claims 1-3, 6, 8, 17 and 20 over the Klumpp reference is also improper because the proposed modification of the primary (Klumpp) reference would undermine its stated purpose. *See* M.P.E.P. § 2143.01, *In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984). Specifically, the asserted modification of the Klumpp reference undermines its purpose directed to using "a liquid source instead of source gasses" in a plasma-enhanced chemical vapor deposition (PECVD) process (*see, e.g.*, the first page of the Klumpp reference). The Klumpp reference uses its liquid-based source instead of a gaseous source to facilitate a low deposition temperature. Klumpp goes on to contrast its liquid-based PECVD process to gaseous deposition approaches, such as those employed in thermally growing S_iC using gas-source chemical-vapor deposition. As such, modifying the Klumpp reference to replace its liquid source with a gaseous source would defeat its stated purpose. Thus, as is consistent with the M.P.E.P. and the *In re Gordon* decision cited above, there is no motivation to modify Klumpp to use source gases. Therefore, the Section 103(a) rejection of claim 1, as well as the rejection of claims 2-3, 6, 8, 17 and 20 that depend from claim 1, should be withdrawn.

The Section 103(a) rejections of claims 4-5, 7 and 18-19 based upon the Coleman reference as a primary reference (in combination with one or more references) are improper because the cited portions of the Coleman reference fail to correspond to the claimed limitations. Specifically, the cited portions of the Coleman reference fail to correspond to the limitations in claim 1 as discussed above. As each of claims 4-5, 7 and 18-19 depend upon claim 1, the Coleman correspondingly fails to disclose all of the limitations in these claims as well. "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). *See, e.g.*, M.P.E.P. § 2143.03. Accordingly, Applicant requests that all of the Section 103(a) rejections based upon the Coleman reference be withdrawn. Notwithstanding, certain ones of the Section 103(a) rejections based upon the Coleman reference are addressed further below.

The Section 103(a) rejection of claim 7 is improper because the cited combination of references fails to teach or suggest claimed limitations directed to CVD at a temperature that facilitates a CVD growth rate of an epitaxial layer that is substantially greater than a CVD growth rate of such an epitaxial layer using hydrogen as a carrier gas. For example, the cited portions of the secondary Kobayashi reference teach that, "(i)n the case where Ar is used as a carrier gas, a drastic reduction of the incubation period is observed compared with the case of H_2, without any apparent change in the layer growth rate" (*see, e.g.*, page 687, the Results and discussion section). In this regard, the cited portions of the Kobayashi reference appear directed to a consistent growth rate approach involving Ar (argon) and thus do not teach or suggest a greater growth rate relative to the use of hydrogen as a carrier gas. Therefore, the Section 103(a) rejection of claim 7 is improper and Applicant requests that it be withdrawn.

The Section 103(a) rejection of claims 18-19 is improper because the cited portions of the secondary Kobayashi reference do not teach or suggest claimed limitations directed to a CVD approach carried out at a temperature of less than about 600°C. On the contrary, the cited portions of the Kobayashi reference teach a two step process, wherein a silicon epitaxial layer is deposited on a silicon substrate using CVD at 750°C, and a Ge layer is deposited at 350°C (*see, e.g.*, page 687, col. 1, third full paragraph). Claim 4, from which claim 18 depends, requires that the epitaxial layer comprise SiGe. Claim 5,

from which claim 19 depends, requires that the epitaxial layer comprises $Si_{1-x-y}Ge_xC_y$. The Kobayashi reference teaches depositing a Ge epitaxial at a temperature of 350°C and does not teach or suggest depositing a SiGe layer or a $Si_{1-x-y}Ge_xC_y$ layer as claimed. Therefore, the cited portions of the Kobayashi reference fail to teach or suggest a CVD (or other) approach carried out at a temperature of less than about 600°C as claimed. Accordingly, the Section 103(a) rejection of claims 18 and 19 is improper and Applicant requests that it be withdrawn.

In view of the remarks above, Applicant believes that each of the rejections has been overcome and the application is in condition for allowance. Should there be any remaining issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Peter Zawilski, of NXP Corporation at (408) 474-9063.

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